Calculus & Analytical Geometry-I

MIDTERM SOLVED PAPERS (PAPER #1)

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Question No: 1 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) > 0$ then f has relative ……. At x_0

- Minima
- Maxima
- None of these

Question No: 2 (Marks: 1) - Please choose one

If f is a twice differentiable function at a stationary point x_0 and $f''(x_0) < 0$ then f has relative ……. At x_0

- Minima
- Maxima
- None of these

Question No: 3 (Marks: 1) - Please choose one

A line $y = y_0$ is called a ……. for the graph f if

$$\lim_{x\to+\infty} f(x) = y_0 \quad or \quad \lim_{x\to-\infty} f(x) = y_0$$

- Vertical asymptotes
- Horizontal asymptotes
- None of these

Question No: 4 (Marks: 1) - Please choose one

If $f(x) = 3x^8 + 2x + 1$ then $f'(x) =$ _____

- $3x^7 + 2$
- $24x^7 + 2$
- $3x^9 + 2x^2$
- $24x^9 + 2x^2$

Question No: 5 (Marks: 1) - Please choose one

$\frac{d(\tan x)}{dx} =$

- $\sec x$
- $\sec^2 x$
- $co\sec x$
- $co\sec^2 x$

Question No: 6 (Marks: 1) - Please choose one

If $xy = 4$ then $\frac{dy}{dx} =$

- 0
- $\frac{-1}{x^2}$
- $\frac{4}{x^2}$
- $\frac{-4}{x^2}$

Question No: 7 (Marks: 1) - Please choose one

If $2x - y = -3$ then $\frac{dy}{dx} =$

- 2
- -2
- 0
- -3

Question No: 8 (Marks: 1) - Please choose one

$\frac{d}{dx}[\sec x] =$ _____

- $\frac{1}{1+\sin^2 x}$
- $\frac{-\sin x}{1+\sin^2 x}$
- $\frac{1}{1-\sin^2 x}$
- $\frac{\sin x}{1-\sin^2 x}$

Question No: 9 (Marks: 1) - Please choose one

30^0 = _____

3 $\frac{\pi}{3}$

3 $\frac{\pi}{4}$

3 $\frac{\pi}{6}$

3 $\frac{\pi}{2}$

Question No: 10 (Marks: 1) - Please choose one

Consider a function $h(x)$ and a constant c then

$\frac{d}{dx}\left((c)\{h(x)\}\right)$ = _____

3 0

3 $\frac{d}{dx}\left(h(x)\right)$

3 $\frac{d}{dx}\left(h(cx)\right)$

3 $c\frac{d}{dx}\left(h(x)\right)$

Question No: 11 (Marks: 1) - Please choose one

Suppose that f and g are differentiable functions of x then

$\frac{d}{dx}\left[\frac{f}{g}\right]$ =

3 $\frac{[g][f']-[f][g']}{g^2}$

3 $\frac{[g'][f]-[f'][g]}{g^2}$

$\frac{[g][f']-[f][g']}{f^2}$

3

$\frac{[g'][f]-[f'][g]}{f^2}$

3

Question No: 12 (Marks: 1) - Please choose one

$\frac{d}{dx}[\text{cosec } x] =$ _____

$\frac{1}{1+\cos^2 x}$

3

$\frac{-\cos x}{1-\cos^2 x}$

3

$\frac{-\cos x}{1-\cos^2 x}$

3

$\frac{1}{1-\cos^2 x}$

3

Question No: 13 (Marks: 1) - Please choose one

If $y = f\left(g\left(h(x)\right)\right)$

$u = g\left(h(x)\right)$

$v = h(x)$ then $\frac{dy}{dx}$ = _____

$\frac{dy}{du}.\frac{du}{dv}.\frac{dv}{dx}$

3

$\frac{dy}{du}\frac{du}{dv}\frac{dv}{dx}$

3

$\frac{dv}{du}.\frac{du}{dv}.\frac{dy}{dx}$

3

Question No: 14 (Marks: 1) - Please choose one

Chain rule is a rule for differentiating _____ of functions.

3 Product

3 Sum

- Difference
- Composition

Question No: 15 (Marks: 1) - Please choose one

The power rule, $\frac{d}{dx}[x^n] = nx^{n-1}$ holds if n is _____

- An integer
- A rational number
- An irrational number
- All of the above

Question No: 16 (Marks: 1) - Please choose one

Let a function f be defined on an interval, and let x_1 and x_2 denotes two distinct points in that interval. If $f(x_1) = f(x_2)$ for all points x_1 and x_2 then which of the following statement is correct?

- f is a decreasing function
- f is an increasing function
- f is a constant function

Question No: 17 (Marks: 1) - Please choose one

If $f''(x) < 0$ on an open interval (a,b) then which of the following statement is correct?

- f is concave up on (a, b).
- f is concave down on (a, b)
- f is linear on (a, b).

Question No: 18 (Marks: 1) - Please choose one

If $x > \frac{1}{2}$ *then* $\frac{d}{dx}[\ln 2x] =$ _____

- $\frac{1}{x}$
- $\frac{2}{x}$
- $\frac{1}{2x}$
- $\frac{2}{x^2}$

Question No: 19 (Marks: 1) - Please choose one

Let $y = (x^3 + 2x)^{37}$. Which of the following is correct?

$\frac{dy}{dx} = (37)(x^3 + 2x)^{36}$

3

$\frac{dy}{dx} = 111x^2(x^3 + 2x)^{36}$

3

$\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{36}$

3

$\frac{dy}{dx} = (111x^2 + 74)(x^3 + 2x)^{38}$

3

Question No: 20 (Marks: 1) - Please choose one

If we have $x^2 + y^2 = 1$ then $\frac{dy}{dx} =$ _____

$\frac{-x}{y}$

3

$\frac{x}{y}$

3

$\frac{-y}{x}$

3

3 None of these

Question No: 21 (Marks: 1) - Please choose one

$\log_b ac =$ _____

$\log_b a + \log_b c$

3

$\log_b a - \log_b c$

3

$\frac{\log_b a}{\log_b c}$

3

$(\log_b a)(\log_b c)$

3

Question No: 22 (Marks: 1) - Please choose one

$\log_b a^r =$ _____

3 $a \log_b r$

3 $r \log_b a$

3 $\frac{\log_b a}{\log_b r}$

3 $\log_b a + \log_b r$

Question No: 23 (Marks: 1) - Please choose one

$\log_b \frac{1}{c} =$ _____

3 $\log_b c$

3 $1 - \log_b c$

3 $-\log_b c$

3 $1 + \log_b c$

Question No: 24 (Marks: 1) - Please choose one

$\log_b \frac{1}{t} =$ _____

3 $\log_b t$

3 $1 - \log_b t$

3 $1 + \log_b t$

3 $-\log_b t$

Question No: 25 (Marks: 3)

Differentiate:

$$f(t) = (t^3 + 4)^4$$

$$f'(t) = 4(t^3 + 4)^3 . \frac{d}{dx}(t^3 + 4)$$

$$f'(t) = 4(t^3 + 4)^3 . 3t^2$$

$$f'(t) = 12t^2 (t^3 + 4)^3$$

Question No: 26 (Marks: 5)

Differentiate $\sqrt{13x^2-5x+8}$

$$f`(x)=\frac{1}{2\sqrt{13x^2-5x+8}}\frac{d}{dx}13x^2-5x+8$$

$$f`(x)=\frac{1}{2\sqrt{13x^2-5x+8}}.26x-5$$

Question No: 27 (Marks: 10)

Differentiate the following function

$$f(x)=x^3\,.\,e^{\frac{1}{x}}$$

$$f`(x)=3x^2\,.\,e^{\frac{1}{x}}+x^3\,.\,e^{\frac{1}{x}}-\frac{1}{x^2}$$

$$f`(x)=3x^2\,.\,e^{\frac{1}{x}}-\frac{x^3\,.\,e^{\frac{1}{x}}}{x^2}$$

$$f`(x)=e^{\frac{1}{x}}[3x^2-\frac{x^3}{x^2}]$$

$$f`(x)=e^{\frac{1}{x}}[\frac{3x^4-x^3}{x^2}]$$

$$f`(x)=xe^{\frac{1}{x}}[\frac{3x^3}{x^2}-\frac{x^2}{x^2}]$$

$$f`(x)=xe^{\frac{1}{x}}[3x-1]Ans$$